ENGINEERING LITERATURE

Supplement to ENGINEERING NEWS. 220 Broadway, New York, November 17, 1910.

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EDITORIAL.

How May an Engineer Make Best Use of Current Engineering Literature?

Forty or fifty years ago, an engineer with a thorough knowledge of surveying, a railroad field manual and a well worn copy of Trautwine's Pocket Book, could consider himself a past-master of his craft. At that time engineering work covered a very limited field and engineering literature was almost non-existent. What a revolution has taken place within the lifetime of many a practising engineer! The engineer can no longer carry his library in his pocket; neither can he carry in his mind and memory all the engineering lore that he needs if he fills or hopes to fill anything more than a subordinate place in the profession. It is necessary, therefore, for the engineer to-day to be able to find in published literature the knowledge he requires and he must be able to read such literature understandingly and form a correct judgment as to its reliability and its bearing on his own problems.

It is the acquirement of this ability that gives the college-trained engineer (or some college-trained engineers) a large advantage over many of the engineers who have learned their profession in the school of practical experience. A technical education can do nothing more beneficial for a man than to make him familiar with the best and most authoritative engineering literature. Further, if the text-books are judiciously selected, they may form the nucleus of the engineer's working library.

To remain abreast of his profession, the engineer must read some at least of the current engineering periodicals and publications of engineering societies. At first glance, the immense mass of this literature now published makes the task seem appalling. Encouragement is found, however, in the fact that much which is printed is not of permanent value and may be merely glanced at or passed over entirely. Further, an engineer needs only to keep track of the particular field in which his work (and his future work) lies, with only enough attention to what is being done in other fields to keep himself from becoming narrow. Much of the data in current literature soon finds its way into published text-books. The engineer, therefore, will do well to follow these. The text-books, however, are usually from one to five years behind the state of the art they profess to cover. Moreover, there is considerable matter in the current publications which is omitted or overlooked by the text-book writers. It is not a safe plan, therefore, to rely upon the text-books alone. An engineer should know, therefore, first, how to quickly turn to his own reference library for information on any particular subject in his own field of work, second, how to search in larger libraries for data which his own library may not contain. In other words, he should first have his own reference library indexed, and second he should know how to use the published indexes to engineering literature in general, such as those issued by the "Engineering Magazine" or the book indexes to the volumes of Engineering News, which are now available covering the entire period from the founding of this journal in 1874 to the end of 1909.

We would speak, however, more especially of the first task, keeping one's own card index to the special articles most likely to be of direct use, and to the books, reports or other publications which one may notice from time to time as probably especially desirable for reference. Not only is a card index, properly kept, a most useful tool, but the work of keeping the index is a most beneficial exercise to a young engineer in cultivating system in his professional reading and the critical faculty in his study of engineering papers. We venture, therefore, on a few suggestions to the young engineer or engineering student just beginning the task of making his own card index.

In reading your copies of Engineering News or other publications, find the articles most useful to you and read them thoroughly. Then fill out a reference card to this article; for this purpose you should carry a pocket-case with a few reference cards. A few moments thus spent may some time save you as many hours of fruitless search for an article you have read but you have forgotten where or when. File the cards systematically under such headings as seem to you most fit. Each card should, of course, show the subject of the article, the author's name, with notes as to whether illustrated or not; the approximate length; the name of the book or paper, and the page number and date of issue. It will save much time to have the index cards printed, with blanks for these several items, to economize time in filling out the cards.

Do not attempt too elaborate a classification. Where the index is primarily for your own use, many short cuts and time-saving abbreviations are allowable. It will not generally be necessary to make more than one card for an article, if you classify the article under the subject in it which appeals to you most; for you can remember under what heading you have placed a certain type of article. Do not try to index too many articles. Choose those in the field in which you are chiefly interested and those which contain matter of permanent value. Cultivate the habit of critical analysis of engineering literature. Such analysis will be a mental tonic to you.

Do not be discouraged if your index file grows slowly, provided it grows steadily; some day you will regard it with no small satisfaction. It is part of your capital in business and gathering it should be part of your regular work.

Do not confine your indexing to articles in periodicals or society publications. Whenever you come across an important book, or the review of such a book, or perhaps a particular chapter in a book, make some note that will help you to find it again.

It is often best to index an article under some other head than its title; for the title is often chosen rather to attract the reader's attention than to accurately show what the article is about. Do not confine your attention to long descriptive articles. Sometimes a paragraph or two in the editorial columns or in letters conveys more important information than an article of several pages devoted to description. Even if you cannot file the copies of the papers to which you subscribe, it is often worth while to index them. You can perhaps refer to the bound volumes at some engineering reference library. Some engineers cut out articles on a certain subject and file them in envelopes. This serves well for a limited range of subjects, but rapidly grows bulky if to much is attempted. Remember that any such file of clippings and your card index should be supplementary to the regular published indexes of your journal. Rely on the published indexes for general access to your library as well as the public reference libraries. Keep your own index for the matter in which you are so much interested that you want it covered in greater detail than is possible in the published indexes.

A useful and convenient manual is furnished by the new "Year-Book" of the American Society for Testing Materials, in which all specifications which the society has adopted are brought together, in their latest revised form. Hitherto these specifications were published as separate pamphlets, besides being contained in their several places in the volume of "Transactions." Under the old arrangement the engineer who desired to refer to a particular specification, say the Timber Grading specification standard for 1909, had to dig through the volumes of "Transactions" from 1909 back, with the possibility of going through half a dozen volumes before finding it. The 1909 Portland Cement specification, on the other hand, would be located in another volume, and in the meantime the searcher would be liable to trip up among a number of "Progress" or "Preliminary" reports, or among specifications recommended but not yet put to vote. He would, therefore, take the shorter course of writing to the secretary for a separate copy of the particular specification desired; this, of course, meant delay, and extra labor, which in the less important cases might be an effective deterrent. Now, however, with the "Year-Book" on file, it is possible to refer to all or any specification at a moment's notice, with certainty of finding the right one.

This arrangement, valuable enough even now, is bound to prove indispensable as time goes on and the society's specifications increase in numbers and go through successive revisions. The range of engineering and industrial raw materials, intermediate products and finished products is very large; most of them are susceptible of control by standard specifications, and the Society, if it lives up to its promise will ultimately deal with all the more important of them. The "Year-Book" then will become a manual on Materials, of value hard to over-estimate.

The Council of the Society for the Promotion of Engineering Education recently decided to make a year's trial of the publication of a monthly bulletin. Several numbers have now appeared in small octavo size. The apparent intention is to publish in the bulletin papers presented at the annual meetings, in hopes of securing written discussions in the annual volume of proceedings. In addition, various notes on the engineering schools, and on other matters of likely interest to the members, are being included, Prof. H. H. Norris, of Cornell University, Ithaca, N. Y., is Secretary of the Society.

Two Books on Applied Thermodynamics.

Reviewed by LIONEL S. MARKS,* M. Am. Soc. M. E.

APPLIED THERMODYNAMICS FOR ENGINEERS.—By William D. Ennis, M. E., M. Am. Soc. M. E. New York: D. Van Nostrand Co. Cloth; 6½ x 9½ ins.; pp. 438; 316 text illustrations. $4.50, net.

APPLIED THERMODYNAMICS.—By H. W. Spangler, Philadelphia, Pa.: John Jos. McVey. Cloth; 6 x 9¼ ins.; pp. 160; 76 text illustrations. $2.50, net.

The treatises on Applied Thermodynamics in the English language have been fairly numerous. In England the subject has most commonly been handled in books on the steam engine, such as Rankine's "Steam Engine," Cotterill's "Steam Engine," Ewing's "Steam Engine" or Ripper's "Steam Engine," though occasionally the whole book has been devoted to thermodynamics as, for instance, in Popplewell's "Heat and Heat Engines." In the books mentioned on the steam engine, the subject is considered with a restricted outlook, the narrowness of which, however, is in great part counterbalanced by lucid and admirable handling. The American books have, for the most part, been devoted to the subject of thermodynamics. It is true that some books such as Thurston's "Manual of the Steam Engine" and a number of later books on heat engines or steam engines, including Heck's valuable work, treat the subject as incidental to the general study of heat engines or steam engines; but that can scarcely be considered the normal American method. The principal books devoted entirely to applied thermodynamics include Wood's Thermodynamics, Peabody's Thermodynamics of the Steam Engine (which held the premier position for many years), the original and stimulating book by Reeve, and the excellent small books by Pupin, Spangler and Hirschfeld. Besides these there are available, English translations of the works of Clausius, Roentgen and Zeuner.

In spite of this considerable number of available works, many of which are of great merit, there has been a considerable demand lately for new books on this subject. The teacher of the subject has not only met the usual difficulty of finding a book that covers just as much of the field as is taught in the particular courses in his institution, but has also found that the development of engineering practice is giving different emphasis to different parts of the subject, and that recent investigations on the properties of the working substances in steam and gas engines render obsolete much that has been written hitherto. This new demand is certain to result in the appearance in the immediate future of a new army of books of which those under review may be considered as the vanguard.

Most of the books referred to above have been rather narrowly written by technical men for technical students. They take a narrow section from the science of physics and apply it directly to heat-engine phenomena and problems. They have not the larger view which would relate the particular matters under discussion to other physical phenomena and which would thereby tend to give a larger interest to the subject. They have not the view of the physicist, but of the technician. This more restricted view is certainly not a defect in such books—it makes for higher concentration and greater efficiency in the use of thermodynamics as a tool. But at the same time it is desirable that other books should have the broader view. The thing has been accomplished by Lorenz in his "Technische Wärmelehre" and it is now attempted by Professor Ennis.

From the strictly professional point of view of the engineer, the kinetic theory of gases and the wonderful light that it has thrown on such diverse things as the ratio of the specific heats ($C_p \div C_v$), the properties of diffusion, and of conduction of heat in gases; the remarkable equation of Van der Wals and the light it has thrown on the behavior of gases under high pressure; the phenomena occurring in the vicinity of the critical temperature and pressure; and other such matters, are of no practical value. It is nevertheless pleasant to welcome a work in which some attempt is made to suggest to the student the existence of phenomena and hypotheses outside those which he is required to study. This is one noteworthy feature of Ennis' book. Another is the continual reference to original sources and the presentation to the reader of such information as permits him to see for himself the probable order of accuracy of our knowledge in many fields. That is, the book is not the usual ex cathedra type of text-book but is a scholarly resumé of the present day knowledge in certain selected parts of the subject of applied thermodynamics. It is thoroughly up-to-date in nearly all its parts and is admirably presented. It differs from the older type of book in that current practice is treated as incidental to thermodynamic theory instead of the reverse.

The preliminary topics are considered in the first eight chapters in the following order: the nature and effects of heat, the first law, the laws and properties of gases, specific heats, expansions and their graphical representation, the Carnot cycle, the second law, and entropy. Then follow three chapters of applications to compressed air, hot air engines and gas power. The chapter on compressed air is a good example of the author's method of treating the applications; after a page of generalities and historical matter there comes the analysis of the air-engine cycle, a discussion of preheaters, of cylinder volumes and of the actual design and performance of an air engine; then follows the discussion of the theoretical and actual compression cycles, of water jacketing, of multi-stage compression, of intercooling and intercoolers and of the power requirements; the engine and compressor relations come next with discussion of losses and efficiencies for the various types; then compressor design, single and multi stage, classification and description of commercial types of compression machinery with details of construction; and lastly compressed air transmission. The chapter on gas power includes the producer as well as the engine and is even more comprehensive.

The second half of the book is devoted to the properties and applications of vapors. An excellent chapter on the properties of steam is followed by others on the steam engine, the steam turbine, the results of tests of engines and turbines, and steam power plants. The last two chapters take up distillation, fusion and the liquefaction of gases, and mechanical refrigeration.

It is hardly practicable to separate out parts of this book for special mention; a judicious balance is maintained throughout the work. There is but little that is new (and there is no reason to expect new matter in a text-book), but the author has certainly succeeded in extracting much of what is most valuable from the existing literature, German as well as English. A few topics have been omitted which might reasonably have been expected in a work of this scope. The most important of these is a discussion of the variation of specific heat of gas with temperature and the calculation of the gas-engine cycle taking this variation into account.

Each chapter is concluded with a summary of its contents and with a considerable number of carefully thought out, useful, and suggestive problems. The letter press is in two sizes of type, but the scheme of division between the two sizes is not apparent. The constant use of bold faced type for sub-headings for each paragraph and elsewhere adds considerably to the value and usefulness of the book. The illustrations are good.

Professor Ennis is to be congratulated on having produced a really attractive and valuable text-book which should be equally useful both to engineers and to students.

It is nine years since Professor Spangler's "Notes on Thermodynamics" was published by John Wiley & Co. That book is a brief summary of the elements of what the author calls the theoretical side of thermodynamics. There is now issued in a different form and by a different publisher a small volume on applied thermodynamics which is to be considered as supplementary to the "Notes" or to some other short treatise on elementary thermodynamics and which does not take up the elementary and fundamental conceptions and theories but starts immediately with their application.

The first chapter deals with the laws of the flow of gases and vapors and illustrates very prettily the phenomena of maximum weight-flow for various substances. The flow of steam through nozzles of various forms and the accompanying friction losses take up most of the next chapter. After some discussion of heat engine efficiencies, the Ericsson air engine is analyzed in an unusually complete manner, the calculations being based upon the results of tests in which temperature measurements were made; the Stirling and Joule engines are treated more summarily. The steam engine occupies a smaller proportion of the total space than is usual—the greater part of that space is devoted to the determination of the variation of steam engine efficiency with superheat, vacuum and drop; a useful tabulation of the results of steam engine and turbine tests; and to Callendar and Nicolson's experiments on cylinder condensation.

The second half of the book deals with refrigeration, internal combustion engines, and evaporators. Refrigeration occupies three chapters devoted to air machines, vapor compression machines and absorption machines. The author describes his treatment of the absorption machine as the most unsatisfactory part of the text and explains that the data available are so meager that any attempt at the thermodynamic treatment is only tentative. The reviewer agrees with his judgment in this matter but must point out to the unexpert reader that the purely thermal treatment (that is, the heat balance treatment) can now be carried out with fair accuracy and is presented very satisfactorily in this book. In fact this chapter on absorption machines is, in comparison with other books on thermodynamics, one of the best in the book.

The method adopted by Professor Spangler for finding the work done during adiabatic expansion in internal combustion motors, taking into account the variability of the specific heat of the working substance, can hardly be considered as altogether satisfactory. He assumes the specific heats to vary proportionately to the increase in temperature and deduces the equation relating pressure, volume, and temperature along an adiabatic. The initial conditions and the final volume being known, he then assumes the final temperature and calculates the corresponding pressure. He further assumes that the curve connecting the terminal points is exponental and finds the value of the exponent from the terminal temperatures by means of an equation which he deduces. If this value of the exponent gives a value of the final pressure differing appreciably from that calculated from his adiabatic equation, a new assumption must be made of the final temperature and another trial made. This procedure has but little to recommend it on the score of either convenience or of accuracy.

In the final chapter is contained descriptions of the action of the modern multiple effect evaporator and of cooling towers and an analysis of their thermal balances.

The most marked characteristic of the volume is that its contents are selected; that is, it does not make any attempt to cover comprehensively the usual field of books on applied thermodynamics. In each of the customary subdivisions of the subject one or two topics are taken up and for the most part are handled in an original, suggestive and interesting manner. The incompleteness of the work will, however, detract from its general value as a text-book or book of reference.

ZINC MINING IN TENNESSEE.—By Samuel W. Osgood. Knoxville, Tenn: Pub. Doc, State Geological Survey. Paper; 6 x 9 ins.; pp. 18; 8 text illustrations.

The purpose of this little pamphlet is to set forth the zinc mining possibilities of Tennessee. The extent of mining and smelting there and the recent progress in developing the industry are briefly treated.

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A Popular Treatise on Roadmaking.

Reviewed by SAMUEL WHINERY,* M. Am. Soc. C. E.; M. Am. Soc. M. E.

THE ART OF ROADMAKING.—Treating of the Various Problems and Operations in the Construction and Maintenance of Roads, Streets, and Pavements. Written in non-technical language, suitable for the general reader; with an extensive bibliography and a descriptive list of reliable current books and pamphlets on these subjects. By Harwood Frost, B. A. Sc., M. Am. Soc. M. E. New York: The Engineering News Publishing Co. London, England: Constable & Co., Ltd. Cloth; 6 x 9¼ ins.; pp. 544; 234 text illustrations; 5 appendixes. $3, net.

In the preface the author says:

This book is intended to give an outline of the history of road building of the problems that confront the engineer in the location, construction and maintenance of roads; of the properties of the various roadmaking materials, and of many other features of the subject, and an effort has been made to present this information in a style suitable for the intelligent reader with or without previous technical experience.

He frankly says:

No claim is made for originality in contents, or for the presentation of new ideas and methods.

The book is a compilation, or resumé, brought up to date, of the literature of road and pavement construction and maintenance. It was obviously intended for the student and general reader rather than for the professional engineer, though the latter will find it a very convenient book of reference for facts and figures often needed but not readily carried in the mind. The intelligent general reader will welcome the freedom from technical expressions and language, and particularly the absence of complicated mathematical formulas.

Following the preface is printed the poem recited by Mme. Bartet at the notable Gala Performance at the Comédie Française, in honor of the First International Road Congress, held in Paris in October, 1908.

The first five chapters are devoted to the preliminary and general principles of highway location, construction and use. These chapters necessarily follow the general outline and cover much the same ground as the earlier books on the subject, but with a degree of brevity and perspicuity not always found in such books.

In Chapter VI., relating to the "Materials Used in Road Construction," the reader will find a very satisfactory and quite complete treatment of the subject, in which the latest methods and results of investigating and testing the materials used in road construction are quite fully described, including the work, in this line, accomplished by the Office of Public Roads, Department of Agriculture. The chapter closes with a statement of the fact, not as generally known by the public as it should be, that "The Office of Public Roads of the Department of Agriculture undertakes to make tests and analyses of samples of stones, without charge, and to give advice as to their value for roadbuilding purposes."

Chapter VII. is devoted to "Earth, Gravel, Sand and Clay Roads." Inasmuch as these materials must be largely depended upon for the construction of a great majority of the common roads of the country, this chapter should be of great value to the public, as general principles and sufficient details are clearly and lucidly set out. Six pages are devoted to sand-clay roads—a kind of road that has not until quite recently received the attention it deserves, particularly in the coastal-plane regions of the United States, where other roadbuilding materials are scarce and expensive. At the close of the chapter is given an illustrated description of the tools and appliances used in road construction, several pages being devoted to the description, and the methods of use, of the home-made road drag, which has proved to be a very valuable tool for country road construction and maintenance.

Chapters VIII., IX. and X. are devoted, respectively, to broken stone roads; roads in mountainous districts, and improvement and maintenance of country roads. Chapter XI. treats of the important subject of "control and prevention of road dust." Thirty pages are devoted to this subject, the greater part of which relates to the present popular practice of using oils and tars for the purpose of allaying dust. Scant and inadequate attention is given to the simple old method of sprinkling with water—just now quite unfashionable. An intelligent discussion of this method of dust prevention and road preservation, and what may be accomplished with it under proper management and control, together with data as to quantity of water required and reliable details of cost would have been a welcome and much needed addition to the book.

Chapter XII. contains a very good though brief digest of the laws of the several states designed to aid and encourage good roads.

Chapters XIII. to XVIII., inclusive, are devoted to "City Streets and Pavements." Beyond bringing the literature relating to the several kinds of street pavement up to date, there will be found in these chapters little that is new to engineers or the public upon the subject.

"The Cleaning and Sanitation of City Streets" is the subject of Chapter XIX., the matter being largely condensed from well-known books. It is too large a subject to be adequately presented in a single chapter of any book and might very well have been omitted from this. The next chapter is devoted to sidewalks, curbs and gutters, and presents the subject in a brief though very satisfactory manner. The last chapter treats of miscellaneous roads and pavements—a subject that is always interesting though not of much practical value.

There follow appendices entitled, specifications and contracts; pavement guarantees; concerning the wear of roads by automobiles; statistics of American roads, and a bibliography of roads, streets and pavements. The bibliography covers 27 pages, and is very complete and well arranged. To many students and engineers it will prove to be the most attractive and valuable part of the book and will in itself make the volume a welcome addition to the library of anyone interested in roads and streets.

The chief present value of compilations like this book lies in the fact that they bring the literature of the subject up-to-date in a form convenient for ready reference and practical use. One difficulty met with by the authors of such compilations (unless they be specialists in the subject treated) is the problem of selecting from the mass of literature available that only which is of accredited value; in other words, of separating the wheat from the chaff. That the present volume is not free from errors of judgment in this matter will be noted by its readers. As an example of this may be cited certain statements and conclusions abstracted (see p. 32) from Circular 141, Forest Service, U. S. Department of Agriculture, that are thoroughly discredited by well known facts.

Upon the whole, the book may be fairly characterized as the latest and best resumé, especially for unprofessional readers, of the science and art of road and pavement construction and maintenance.

A notable merit of the book is the large number of excellent cuts and illustrations scattered throughout its pages, beginning with a portrait of John Loudon Macadam.

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STANDARD SPECIFICATIONS.—For Structural Steel—Timber—Concrete and Reinforced Concrete. By John C. Ostrup, C. E., M. Am. Soc. C. E. New York and London England: McGraw-Hill Book Co. Cloth; 6¼ x 9½ ins.; pp. 99; four text illustrations. $1, net.

Ten specifications are included in this collection, upon the following subjects: Steel Framework of Buildings; Highway Bridges; Railroad Bridges; Plate Girders; Materials and Workmanship; Inspection, Painting and Erection; Structural Timber; Cement; Portland-Cement Concrete and Reinforced Concrete. As the preface states, an effort has been made to "conform in every essential to the latest experiments and investigations, to the best authorities, to modern practice and to the author's own considerable experience," with very satisfactory results. Probably the best kind of specifications are not those designed by a single engineer, of whatever breadth of knowledge and experience, but are those threshed out in committee and open meeting by the joint efforts of a number of engineers. Still, there is a very certain value in a collection of specifications on related subjects by one impartial mind, and that value Prof. Ostrup's work can lay valid claim to.

Wireless Telegraphy and Telephony.

Reviewed by SAMUEL SHELDON.*

PRINCIPLES OF WIRELESS TELEGRAPHY.—By Geo. W. Pierce, A. M., Ph. D., Assistant Professor of Physics in Harvard University. New York and London, England: McGraw-Hill Book Co. Cloth; 6¼ x 9½ ins.; pp. 350; 235 text illustrations. $3, net.

WIRELESS TELEGRAPH CONSTRUCTION FOR AMATEURS.—By Alfred Powell Morgan. 188 + iv., 12 mo.; pp. 147; illustrations.

The production and the propagation of a wave disturbance calls for the existence of a medium wherein the wave exists. This medium, because of its physical characteristics or because of its environment, must have two properties, namely, it must be able locally to serve as a storehouse of (1) energy in the potential form, and of (2) energy in the kinetic form. In a pure wave equal amounts of energy of these two forms mutually sustain each other as the wave moves through the medium. In water waves the mass and velocity of the moving particles sustain the elevated particles against the action of gravity. In waves over strings, stretches and centrifugal forces, and in waves through air compression and increased velocity of particles are similarly correlated. The behavior and properties of the media in these cases are fairly well known. In the case of electric waves and light waves, the latter being but a special case of the former, the medium is the ether. Its characteristics and the relations which exist between them are not so well known. An electric field in it represents stored potential energy and a magnetic field in it represents stored kinetic energy. In order to sustain each other in a wave they must move together through the ether, at a velocity which is prescribed by its characteristics, and they carry their energy with them. The launching of such waves, correlated in time, upon the ocean of ether and the detection of their swashing at a distant point constitutes the art of wireless telegraphy.

The first ten chapters or 75 pages of this book are devoted to the characteristics of the medium and to a recital of investigations which have given knowledge concerning them. A rearrangement, condensation and amplification by new material of this portion of this very good book would materially increase its usefulness. The next four chapters describe the systems which have characterized the evolution of the art, and these are followed by a chapter on the behavior of the medium which carries the signaling energy. The next 75 pages treat of Detectors. The author's extensive investigations in this field have resulted in a very interesting and instructive presentation of the subject. Chapters XX to XXV treat of resonance, tuning, and directed wireless telegraphy. The last three chapters deal with wireless telephony, details and general conclusions. Two appendices are added, one giving elementary electrical facts and the other formulas for calculations. In the latter, formula III for the capacity of parallel wires is an approximate one and its use in connection with wireless circuits is likely to lead to errors. The correct formula is $k\,l/4$, divided by the argument of the hyperbolic cosine d/R, electrostatic units.

The book is well written, clear, accurate, and a wealth of material is presented. The arrangement is poor and, from some points of view, distracting. A perusal of the titles of its too many chapters and appendices will convince one of this fact. Although the evolution of the art has resulted, in a great part, from mathematical investigations of the most difficult character, explicit mathematics is practically absent from the book, doubtless thereby making it far more useful to a large number of persons interested in the subject.

The second of the above two books, admirably written, so as to be understood by the average boy, gives a general description of the more common types of apparatus used in this art and gives specific directions for the construction by a novice, of apparatus suitable for operation over limited distances. The directions are clear and the book is well illustrated.

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A New Elementary Metallurgy.

Reviewed by BRADLEY STOUGHTON.*

PRINCIPLES OF METALLURGY.—An Introduction to the Metallurgy of the Metals. By Charles Herman Fulton, E. M., President and Professor of Metallurgy, South Dakota School of Mines. New York and London (England): McGraw-Hill Book Co. Cloth; 6 × 9¼ ins.; pp. 544; 188 illustrations. $5, net.

There is published in the United States no work which covers the subject of introductory or general metallurgy and President Fulton has frequently felt in his work of teaching metallurgy, the lack of a suitable reference and text book of this character. The subject is treated with this need in view, but will also be found useful by practical metallurgists and research students on account of the compilation of modern data and the clear and scientific exposition of recent theories and researches.

The First Chapter is historical in character and; in spite of its brevity, will be found by beginners and practitioners, more interesting than is usually the case with sections of this character in metallurgical text books. In the Second Chapter, on "Physical Mixtures and Thermal Analysis," the author takes up the definition of the terms and methods employed in that branch of metallography which deals with freezing and cooling curves. Evidently it is addressed to students familiar with the general principles of physical chemistry, or else to those who can supplement the text by lecture instruction, and one is carried from this point well up into the theories and principles of the different systems.

The Third Chapter deals with the "Physical Properties of Metals" and is the best collection of modern data on this subject in English text books on metallurgy.

Practically the same comparison may be made in reference to the next two chapters, which comprise the study of alloys, except that, of course, the author cannot here include as much in two chapters as is contained in some of the books devoted exclusively to this subject, but the data given are well chosen and presented. For instruction, as distinguished from reference, we prophesy that these two chapters will be found unusually valuable.

Chapter Six on "The Measurement of High Temperature" logically bridges the gap (if gap there be) between Metallography and Industrial Metallurgy. The principles underlying measurements of this character are comprehensively presented, and although the reviewer does not always agree with the author in regard to his comparison between various forms of pyrometers adapted to practical and scientific work, this must be regarded as a difference of opinion only, and the author could doubtless support his contentions as well or better than the reviewer.

Chapter Seven devotes more than 40 pages to typical metallurgical processes and then the text takes up the study of "Slags" according to the new theories which have proved of such great value in their practical application to industrial smelting operations. Chapter 9 deals with "Matte, Bullion and Speise" from the same scientific viewpoint, and these two chapters alone will make the book well nigh indispensable to practical metallurgists because they bring together the results of researches in English, French and German which could otherwise be obtained only after long search through scattered publications.

Chapters 10 and 11 on "Refractory Materials" and "Fuels" respectively are good but, in the opinion of the reviewer, might have been larger in view of the lack of suitable modern text books dealing with these two important subjects.

Chapter 12 deals with "Combustion" and Chapter 13 with "Furnaces and the Production & Heating of Blast" and the book closes with "An Example Illustrating the Physics and Chemistry of a Smelting Operation."

This book is a step towards the principle so often advocated by teachers of metallurgy, of presenting the subject to students first as an individual science with basic principles and theories common to all of its different branches, rather than treating the metallurgy of each metal as if it had but slight connection with that of its fellow metals, and were not merely one application of the same metallurgical practice. Professor Fulton is well equippel to treat the subject from this broad standpoint, and the result is a book which we believe will be generally approved as the same author's standard text-book on "Assaying."

*Consulting Metallurgical Engineer, 165 Broadway, Nek York City.

THIRD ANNUAL REPORT OF THE BOARD OF WATER SUPPLY OF THE CITY OF NEW YORK, Accompanied by Report of The Chief Engineer, 1908. 6 x 9 ins.; pp. 174; 28 illustrations, with folding map. Address Board of Water Supply, 165 Broadway, New York City.

It is to be regretted that the official reports relating to the work on important engineering enterprises are often greatly delayed in publication. The volume before us covers the year ending Dec. 31, 1908, and is published more than a year and nine months after the period which it covers. We are well aware, however, that such delays in publication are usually due to causes over which the engineers preparing the reports have no control.

As most of our readers know, the work on which the Board of Water Supply is engaged is the provision of a new source of water-supply for New York City from a gathering area in the Catskill Mountains. The total outlay will eventually exceed, it is probable, $150,000,000, and the whole enterprise is of a magnitude unapproached by any other piece of engineering work now in progress in the world, except the Panama Canal. While most of the space in the report is taken up by routine matters, there is a considerable amount of matter of technical interest, including experiments on mortar linings for steel pipes, the best type of nozzles for aerating water, and tests of reinforced-concrete pipes 11 ft. in diameter under heads as great as 125 ft. The report is certainly one which should be on file in engineering reference libraries.

Some Re-Editions.

STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS.—Written and compiled by a staff of specialists. Third edition, fully revised and enlarged. New York and London, England: McGraw-Hill Book Co. Stiff morocco; 4¼ × 6¾ ins.; pp. 1497; numerous text illustrations. $4, net.

It will be recalled that the first edition of this book was arranged on the novel plan of absolutely separate sections, each with its own numbering. The publishers now believe that they are reaping their reward in their ability to completely revise any section without disturbing any other.

In reviewing the first edition of this handbook we pointed out the inconsistency of the title-page claim that each of the 20 sections had been written by a specialist when seven sections were entirely prepared by one of the publisher's editors and three more in part by the same man. That inconsistency is still apparent. As before noted the handbook is encyclopedic in character, theoretical discussions somewhat predominating over information and data on practical matters.

It might not have been expected that a handbook appearing first in 1908 would need a complete revision in 1910, and one is led to suspect that the text of the first two editions was unsatisfactory or insufficient. Certainly the whole complexion of electrical engineering has not changed in this short time. The greatest changes and the most additions are seen in the parts on circuits, measurements, electric properties of materials, motors, transformers and minor power apparatus, power transmission, locomotives, telephony and statistics.

KONDENSATION.—Ein Lehr- und Handbuch über Kondensation und alle damit zusammenhängenden Fragen, auch einschliesslich der Wasserrückkühlung. Für Studierende des Maschinenbaues, Ingenieure, Leiter Grösserer Dampfbetriebe, Chemiker und Zuckertechniker. Bv F. J. Weiss, Zivilingenieur in Basel. Second edition, revised by E. Wiki, Ingenieur, Luzern. Berlin, Germany: Julius Springer. Cloth. 6½ × 9½ ins.; pp. 429; 10 plates (four folding) and 141 text illustrations. 12 marks; American price, $4.80.

"Kondensation," by F. J. Weiss, of Basel, Switzerland, was reviewed at some length when it first appeared, eight years ago.* The author's death made it necessary that the second edition be prepared by other hands. Mr. E. W[illegible] has accomplished the task well. The matter [illegible] condensers and water coolers is not much c[illegible]nged. The most important addition is a chapte[illegible] the Weiss vacuum equalizers, a storage tan[illegible] for the cooling of water, whose object is to [illegible]event fluctuations of vacuum by maintaining [illegible]large supply of water at uniform temperature [illegible]thout requiring this water to be held in the co[illegible]nser itself.

*Eng. News, May 8, 1902, p. 373.

DER TALSPERRENBAU.—Nebst Beschreibung [illegible]sgeführter Talsperren. By P. Ziegler, Königl. B[illegible]t zu Clausthal. Zweite Vollständig Neubearbeite[illegible] Auflage. Berlin, Germany: Wilhelm Ernst & [illegible]ohn. Paper; 7¼ × 10½ ins.; pp. 392; 314 text illust[illegible]ons. 20 marks; cloth, 21.50 marks;; American pric[illegible]$8.

A good German text on dams, Ziegler's "Der Talsperrenbau," is brought up to date in a revised second edition. American practice is well represented in the descriptive part. A short chapter on dam failure is a feature.

HYGIENE AND PUBLIC HEALTH.—By Arthur Whitelegge, C. B., M. D., and George Newman, M. D. New York: Funk & Wagnalls Co. Cloth; 4 × 6½ ins.; pp. 650; 24 text illustrations; 9 appendices. $1.75, net; postpaid, $1.85.

The first edition of this book was published in 1890, and frequent revisions have been made to keep step with the progress of the science. In our issue of Jan. 18, 1906, we reviewed the tenth edition, and we note from the preface of the book now before us that it is the eleventh revision that has been made. Designed primarily for British customs and British readers, the book has much in it of value to sanitarians the world over.

TENEMENT-HOUSE INSPECTOR.—A Text Book for Civil Service Candidates for the Positions of Tenement-House Inspector and Clerk; also for Sanitary and Building Inspectors, Including Answers to All Questions Given in Previous Examinations. Written for "The Chief," Journal of the Civil Service, by George M. Price, M. D., author of "A Handbook on Sanitation," Medical Sanitary Inspector, N. Y. Department of Health. Second edition, revised and improved. New York: The Chief Publishing Co. Cloth; 5¼ × 7 ins.; pp. 287. $1.50, net.

This is the second edition of a book designed primarily as a civil-service instruction book for those who are about to take the examination for tenement-house inspector in the city of New York. In addition to its instruction chapters it contains the New York Plumbing Rules and Regulations, parts of the New York Sanitary Code, and the text of the New York Tenement House Law.

ECONOMIC GEOLOGY.—With Special Reference to the United States. By Heinrich Ries, A. M., Ph. D., Professor of Economic Geology at Cornell University. New and revised edition. New York: The MacMillan Co. Cloth; pp. xxxi + 589; 55 plates; 237 text illustrations. $3.50, net.

The first edition of Prof. Ries' book was published late in 1905 and was reviewed by the late Nathaniel S. Shaler in our issue of Jan. 18, 1906. Its success proved so immediate that another and slightly revised edition appeared hardly a year later and now, after less than four years, a third and considerably enlarged edition has been deemed necessary.

Economic geology is the study of the occurrence and production of those deposits of the earth which have proved useful to man. It does not concern itself with the origin, age or manner of formation of these deposits except in so far as these factors affect the distribution, discovery and manner of development of the products which man utilizes. It is, in short, the engineer's geology, bearing in mind the classic definition of the engineer as he who directs the great sources of power in nature to the use and convenience of man. In its older editions Prof. Ries' "Economic Geology" has been recognized as one of the standard texts on the subject and its value is measurably increased by this latest revision. Wherever recent developments have required a change in the exposition of principles such changes have been made, but the greater portion of the added matter is taken up with revised statistics of production and complete descriptions of occurrences which have lately been discovered. Its conciseness and encyclopedic completeness make it a valuable addition to the engineering library.

A New Edition of Kent's Handbook.

THE MECHANICAL ENGINEERS' POCKET-BOOK.—A Reference-Book of Rules, Tables, Data and Formulae, for the Use of Engineers, Mechanics, and Students. By William Kent, M. E., Sc. D., M. Am. Soc. M. E. Eighth edition, rewritten. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Stiff morocco; 4¼ × 7 ins.; pp. 1461; 218 illustrations. $5, net.

It is safe to venture that nearly all the mechanical and electrical engineers of this country and many civil engineers have a copy of Kent's Handbook in their libraries. Of late years, however, former admirers have been so free to protest about antiquated data, that it seems as if the book had not been the useful reference for engineering performances and practices that it was ten years ago. The cause was not far to seek and is evidently the reason for the present complete revision. The seven previous editions, from 1895 to 1904, were struck off the same plates, practically, as attempts at revision were by the substitution of new paragraphs for old and by the insertion of supplemental page-plates, and appendices. General advances in practice and new data and records certainly have been established, and a study of the new edition shows that a conscientious effort has been made to include recognized best practice and latest data and records, while retaining the useful in the old. The plan of the old Kent's was satisfactory and we believe that the new book, being on the same plan, will be as useful for the next few years as the old one ever was. The condensations are many and the additions are so important that every practicing mechanical engineer will need to file his old edition away with his other ancient histories. Only the most important changes can here be noted.

As one takes the new volume in hand, the first thing noted is that it is a good fraction of an inch thicker and slightly wider. On opening the volume at random the new tables first strike the eye. In resetting the type, a new and simpler numeral has been largely used, evidently a "wide Cheltenham," to use the printer's name, and the improvement is really considerable. It is regrettable that spaces were not used to separate the figures into groups of three for ease in transcribing. Unfavorable comparison with some German tables is possible, but this is always possible with American type fonts.

There are 1,416 pages in this eighth edition as compared with 1,090 in the seventh, an increase of 33%. This, however, does not represent all the new matter as 159 old pages (according to publishers' estimate) have been dropped. This gives 485 pages of new matter forming 34% of the contents of the new edition. The greatest actual additions have been made to sections on steam engines and turbines, materials, iron and steel, hydraulics, air, heating and ventilation, thermodynamics, electrical engineering and machine-shop practice. The greatest percentage of new matter (100) is seen on internal-combustion motors, but more than 50% new is seen also in the sections on iron and steel, air, heating and ventilation, and on foundry work. In the cases of chapters on mathematics, strength of materials, on ropes, chains, springs and joints, and on shafting pulleys, belts and gears the percentage of new material has dropped below 30%, according to the publishers' count.

In reading this volume one is interested in noting the sources of Mr. Kent's information. Naturally a great many of his data on dimensions of machinery have come from the publications of manufacturers. But the information on practice and performance comes mostly from three other sources (1) engineering societies' transactions, (2) engineering journals, and (3) standard treatises. The following record of specific acknowledgments may be of interest:

American Society Transactions	450
British and Foreign Societies	90
Engineering News	105
"Engineering Record"	20
"American Machinist"	100
"Machinery"	23
"Iron Age"	23
"Power and The Engineer"	50
"Engineering" (London)	50
"Engineer" (London)	10
Miscellaneous American journals	190
Standard textbooks and bulletins	200
Miscellaneous British and foreign journals	10

The most familiar part of the book, perhaps, is that on mathematics, weights and measures, etc. Aside from a short paragraph on percentage and efficiency expressions, the only additions seem to be a group of formulas for properties of a circular curve, a discussion of logarithmic paper and a description of the slide rule.

The section on material shows, in general, minor changes to cover the latest facts of chemistry, etc. The data on manufactured materials has been made to include many new figures from the manufacturers. In the section on strength of materials, "columns" has been rearranged and partly rewritten. Pages of matter now of historical value only have been reduced to paragraphs and many old tables have been omitted. Hodgkinson's formulas have been briefly passed over to make room for Euler's, Rankine's and the straight-line expressions. Matter on transverse strength of beams and on properties of rolled sections appears to be as before, except that there are some new tables, particularly of Carnegie Z-bars, and of Bethlehem I-beams and H-columns. There are additions on collapse of tubes, strengths of iron and steel pipes and on holding power of boiler tubes. Some new data is seen on American timbers and various sorts of bricks. New methods for testing the hardness of metals and composition of rubber goods are outlined.

A short section on alloys appears to have been retained with the addition of a few paragraphs and tables on the newer brasses and bronzes, aluminum metals, etc. The short section on springs shows no extensive changes and the following section on riveted joints has the familiar arrangement except where addition has been made on the proportioning of joints.

The several sections on iron and steel show, perhaps the deepest revision, especially in the chemistry of cast iron and foundry practice, in protection of iron against corrosion, and in nickel-steel alloys, and heat treatment for steels. Late specifications for steel for various services have been included, and the older matter has been condensed.

It is worthy of notice that Prof. Kent has still retained a tabulated classification of irons and steels which he advocated in 1887. This arrangement does not seem to have had particular force in fixing the nomenclature of iron products and does not lead to a ready or useful classification of some modern products. Its use is not strengthened by the recent committee report of the American Society For Testing Materials on quite different lines of differentiation.

The revisions of the allied, but not adjacent, sections on the foundry and machine shop show new matter on such topics as improved cupola and blower practice, ferro alloys, permanent molds, new machine tools, high-speed tool steels, milling practice, power requirements, grinding wheels, etc.

The theoretical discussions in mechanics have been retained almost intact; the opening paragraphs, alining matter, force, space and time and discussing weight and mass, alone seem new. The discussions under the head "Heat" show greater change, particularly in dealing with pyrometry, common temperatures in industrial processes, the judging of temperature by color, specific heat, heat in steam, drying processes, and heat radiation and conduction. Thermodynamics has been expanded from one to six pages to include a discussion of the Carnot cycle, entropy and the use of temperature-entropy diagrams. Entropy, the author defines as length on an energy diagram of which the other coordinate is temperature. The section on physical properties of gases has the old statements of the gas laws, etc., with the addition of a paragraph on liquid air and a table of liquefaction points for the common gases.

Under "Fuels," the old classification of coals as long or short flaming, caking, lean, etc., has been dropped for anthracite, semi-bituminous, bituminous, sub-bituminous and lignite. Analyses of coals have been overhauled to show the composition and calorific value of typical coals, in use to-day, from various beds of this continent except Nova Scotia and British Columbia. Old values (1893) of foreign coals have been retained and comparing with some recent British analyses very different ash percentages are seen. The few words on coal sampling have been taken from the old edition, whereas something might better have been said, perhaps, about present practice in taking large representative amounts as the first sample and quartering down to a reasonable size. "Liquid Fuels" now includes alcohol, but nothing is said about the "scalp" petroleum oils, between gasolene ahd lubricating oils. These oils are now left more or less as waste, but seem to have a field which may be developed in the next ten years for gasifying in the so-called "tarless" oil gas producers. That brings to mind that in the new material on gas-producer design ahd practice nothing is said about oil-gas apparatus. Acetylene, and its mother-compound, calcium carbide, gets two pages in the new book. There are no new data (since 1895) in the part on illuminating gas.

Portions relating to steam, steam pipes, boilers, and steam engines shows great changes. Definitions have been changed, to accord with recent views (as expressed by Marks and Davis, C. H. Peabody, etc.) of Rankine's heat unit (B. T. U.) which Kent's earlier editions held to be preferable have given away to Peabody's (heat in raising 1 lb. of water from 62° to 63° F.) and to the latest, by Marks and Davis (1/180th the heat of raising 1 lb. of water from 32° to 212° F.). No preference is shown, however, between these two and the quick searcher has no key to the need for change. In the many reprints which this hand-book has had, the old steam tables compiled from works of Porter, Buel and Dwelshauvers, containing the pioneer data, have been used. In this revision, values from Marks' and Davis' recent work* have supplanted the old ones. It is interesting to note that the old and new figures differ at most only some ¼ of 1% and introduced errors of only about 1% or less into computations, which speaks well for the older investigators. Superheated-steam tables have been added for pressures up to 500 lbs. per sq. in. absolute, together with material of use in designing steam pipe lines.

Under "Steam Boilers" the most notable change is in the table of evaporation factors. New figures have been computed based on Marks and Davis and going up to 250 lbs. gage pressure. Nothing is here said about the few but notable experiments where grates have been installed at the back end of large boilers to double up the capacity and the velocity of gases past the heating surfaces. The author's Syracuse report on smoke prevention (1907) has been substituted for Landreth's Tennessee report (1893). Steel and reinforced-concrete chimneys have been recognized and a few record constructions given.

There is little particularly new in the steam-engine discussions until recent engine tests, as to the effects of steam, vacuum and superheat, are reached. Then following are great changes and additions like power-plant economics and engine-trial rules. The presentation of dimensions of engine parts is as before with a few paragraphs on current practice in 1909. Those who have criticised the multiplicity of formulas for the design of a single engine part will encounter the same trouble as before. A description of the Walschaert valve gear and the author's method of using the Zeuner valve diagram have been inserted. "Condensers" is almost wholly new and quite up to date. The one page on rotary engines of the old editions has become nine on the steam turbine. Internal-combustion engines also have an entirely new section covering theory and performance and showing approved rules for tests. Under "Locomotives" is most of the older material with many comparisons of recent practice. It is worthy of note that one error has persisted all through the early editions to appear in this one. The Engineering News formula for locomotive resistance (1894) is given as lbs. per ton $= \frac{1}{4} v + 4$, whereas it should be $\frac{1}{4} v + 2$.

The shafting formulas and tables have been changed and seem to approve of slightly larger

*"Tables and Diagrams of the Thermal Properties of Saturated and Superheated Steam," reviewed by Prof. Kent in Engineering News, Aug. 12, 1909.

loads in some cases. Barth's studies on belt tensions has been included and chain drives have been given a little space. Some new formulas for heavy crane hooks are shown which will be appreciated, though they are perhaps not as simple as some in the "Hutte" hand-book.

In the new parts relating to "refrigerating machinery" are some new tables of the properties of ammonia, supplementing old ones, information on calcium chloride as a brine salt, on miscellaneous performance.

The leading additions to "Marine Engineering" are a table of performance of notable transatlantic boats, a few paragraphs about the "Lusitania," S. W. Barnaby's figures on ratios of screw propellers, and a review of tendencies in size and equipment.

There is a section on building construction having five pages more than in previous editions. It is, of course, only fragmentary, but it has that of most use to mechanical engineers—common figures for foundations, floors, walls and roofs and a summary of Mr. C. T. Main's recent paper in Engineering News on the cost of mill buildings.

Much space is given to electrical engineering. Litle of the theoretical matter is new, but an important addition has been made on "illumination" by giving some of the important ideas developed in the last five years. "Electric welding" is the same as before, and here the opportunity has been passed by for telling something about the important work of track welding. The old and none too useful pages on dynamo design have been dropped to make room for new data on dimensions and performances of various classes of electric motors.

In "heating and ventilation" the author has published much original matter. As this section now stands it is really a condensed but fairly complete treatise on the several general heating systems, ventilating entering only incidentally except for mines.

The index, at a few points, is a disappointment. It seems an inadequate key to many useful data locked up to the occasional searcher. One who has occasion to refer to the book often we believe will rely on his knowledge of the different sections and his ability to run over the pages quickly. To cite one instance, the index has no direct reference to forcing a boiler or to driving, but a search reveals two pages on the relations between rate of driving and efficiency. Similarly, if one desires to find low freezing-point mixtures, he must know that the place to look is in refrigerating machinery and then under properties of brine.

A New American Book on Sewage Disposal.

SEWAGE DISPOSAL.—By Leonard P. Kinnicutt, Director Department of Chemistry, and Professor of Sanitary Chemistry in the Worcester Polytechnic Institute; C.—E. A. Winslow, Assistant Professor of Biology, Massachusetts Institute of Technology, and R. Winthrop Pratt, Chief Engineer of the Ohio State Board of Health. First edition. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¾ x 9¼ ins.; pp. xxvi. + 436; 113 text illustrations. $3, net; English price, 12s. 6d., net.

There has long been a need for a comprehensive new book on sewage disposal, written primarily for Americans, but taking account of British, German and French ideas and practice. We say a new book, because for many years after 1894 Rafter and Baker's "Sewage Disposal in the United States" supplied American needs as well as any one book could be expected to do. That work, however, was written when chemical precipitation, sewage farming and intermittent filtration, the latter more particularly in the United States, were at their height. In the few years immediately following the appearance of "Sewage Disposal in the United States" the bacterial action but recently made known as the basis of broad irrigation and intermittent filtration was utilized to a heightened degree by means of the contact bed and the percolating filter, and at the same time the anaerobic bacteria of the common cesspool were pressed into service on a large scale by means of the septic tank. It therefore happened that within four to six years after its appearance Rafter and Baker's work was in great need of supplementary chapters—the original volume even to-day serving a useful purpose, so far as it goes.

Save for periodical and other fragmentary writings, and a single but inadequate book, no one in America had the courage to attempt a survey of the sewage disposal field for some fourteen years after the work done by Rafter and Baker. That fact may be regarded as an acknowledgement of the broad lines on which the senior author, the late George W. Rafter, blocked out the book and of the patience and skill in which he filled in its many details. The hesitancy of other American authors to attempt to cover the whole field of sewage disposal in a new volume was also partly due to the fact that until well into the present century nearly all of both the experimental and practical work on contact beds, percolating filters and septic tanks had been done abroad, chiefly in England, and that Rideal and Barwise had promptly chronicled the laboratory and sewage works results there attained in their admirable books on the so-called bacterial processes of sewage treatment, while numerous other British writers, particularly Dibdin, had also contributed to the newer literature of sewage purification.

It is a notable fact that nearly all the many British books on sewage disposal have been written by chemists or biologists. Until very recently the chief of the few exceptions to this fact was the late W. Santo Crimp's "Sewage Disposal Works," long since out of date, and principally valuable for descriptions of actual works. Seven years ago, when the present writer was in England, Dr. Samuel Rideal expressed admiration of the co-operation between American engineers, chemists and bacteriologists in their professional work on sewage disposal, which he stated was in marked contrast to British practice. A further instance of American co-operation is afforded by the joining together of a chemist, a biologist and an engineer in the production of the American book now before us. We hardly need say that Professor Kinnicutt has been intimately connected with sewage disposal problems for thirty years, at Worcester and elsewhere; that Professor Winslow has delved far into the subject in connection with the long series of experiments which he has directed in Boston; and that Mr. Pratt has passed on many plans for sewage disposal works and on the operation of numerous plants in his official capacity in Ohio, besides having designed and built actual disposal works. Our three authors are therefore well fitted for their joint task, and their book shows that they have done good team work.

Coming now to a more direct consideration of the book under review, we cannot give a better idea of the aim of the authors than to quote a paragraph from their preface, stopping to remark that the two recent books named in the first sentence of the quotation are most excellent treatises,* Mr. Raikes being a British engineer and Dr. Dunbar being director of the Hygienic Institute of Hamburg, Germany, and having carried on extensive experiments on sewage purification, besides designing several sewage works. We quote as follows:

> When this book was begun, neither H. P. Raikes' "Design, Construction and Maintenance of Sewage Disposal Works," nor H. T. Calvert's translation of Dunbar's "Principles of Sewage Treatment" had been published. Even after these excellent books appeared, however, it still seemed to us that there remained room for a general survey of the problem from the various viewpoints of the chemist, the sanitary biologist and the engineer, and with particular reference to the conditions of American practice.
>
> It has been our aim to discuss somewhat fully the fundamental principles of chemistry and bacteriology which are involved, and yet to include also the more important aspects of the engineering works designated to carry them into operation. It is hoped that the book may be useful to the student of sanitary engineering who aims to fit himself for the construction of sewage disposal works, to the engineer who, after working in other lines, is drawn into this growing field, and to the chemist, the bacteriologist and the public health official concerned in the operation of disposal works after they are built.

The authors have aimed well and have hit their mark. It is safe to say that no one of them alone and no two of them together could have produced a single book so well suited to "the chemist, the sanitary biologist and the engineer," and at the same time to the "student of sanitary engineering" and to the "public health official."

*Reviewed in this Supplement for Aug. 13, 1908, and for Apr. 15, 1909, respectively.

The volume opens with a brief introduct[ion] in which the authors set forth clearly the wh[at] and wherefore of the sewage disposal problem, b[e]ginning with primitive methods of dealing wi[th] excreta and touching upon dry closets, the [wa]ter-carriage system, the relation between e[f]fluent sewerage systems and the death-rate, and [fi]nally outlining "the new problem of sewage disp[osal]."

Without attempting to take up each chap[ter] in detail it may be said that, the introductio[n] finished, the authors first discuss the composit[ion] of sewage, disposal by dilution, screening and s[ed]imenting. After these first three chapters come [th]ree others, all dealing with preliminary treatm[ent]: by (1) sedimentation; (2) chemical precipit[ation]; (3) the septic process. The last-named ch[apt]er contains a brief review of American septic-[tan]k patent litigation and also an interesting di[sc]ussion of the hydrolytic tank and the "Ham[pton] doctrine"; also an account of the Imhoff or [Em]scher tank, which effects the same general pur[po]se as the hydrolytic tank. The seventh chapter deals with sludge disposal.

The various preliminary processes having been covered the authors next take up "purification of sewage" by: (1) broad irrigation and sewage farming; (2) intermittent filtration, through sand; (3) contact beds; (4) and "trickling or percolating beds."

A separate chapter is given to the disinfection of sewage and sewage effluents. Finally, there is compressed into fifteen pages a good general idea of the essential features and methods of sewage analysis.

The general plan followed in each of the several chapters is to present a brief historical review of the subject treated. At the same time the authors give a general idea of the subject under discussion and follow this and the historical matter by discussion of details. Two notable features of the book are its sections on design and construction, and on first cost, operating and capital charges. Another notable feature is a series of statements of relative advantages and disadvantages of the different processes being decribed.

The book throughout abounds with citations from various American and foreign authorities There are also given concise descriptions of a number of actual sewage disposal plants. These descriptions admirably supplement the general discusion without overloading the book with categorical detail.

In a book of the character and authorship indicated by the foregoing outline, one could hardly expect much original writing. As a matter of fact, the volume is largely a compilation with great condensation, but the compilation has been made with most admirable discretion after a close search of all available material. At many points throughout the book valuable criticisms are supplied and opinions offered based on the wide knowledge and experience of one or the other of the three authors. Without attempting to go at all into the "higher criticism" a person acquainted with each of the authors can readily detect facts or ideas which one of them has apparently inserted in the original subject matter of another author. This is always done with judgment and without leading to divided opinion. We mention it only to illustrate the character and value of the teamwork which has already been mentioned.

Finally, we wish most heartily to commend the authors for having so concisely and satisfactorily reviewed so complex and extensive a subject as is sewage disposal to-day. A word of praise should also be given to both authors and publishers for the general make-up of the book, and particularly for having made available so much valuable material at so reasonable a price.

COMMISSION PLAN OF CITY GOVERNMENT.—Bulletin of Extension Division of The University of Wisconsin. Madison: The University. 5 x 7⅛ ins.; pp. 18.

A very brief outline of the main features of the commission plan of city government, with synopses of arguments pro and con and various references on either side, is followed by a copy of a Wisconsin statute of 1909, authorizing the establishment of commission government for cities of the second, third and fourth classes.

A Compendium on Conservation, With Critical Comments.

THE CONSERVATION OF NATURAL RESOURCES IN THE UNITED STATES.—By Charles Richard Van Hise, Madison, Wis. New York: The Macmillan Company. Cloth; 5⅛ x 8 ins.; pp. 413; 16 plates and 30 illustrations. $2, net.

Professor Van Hise has rendered a notable service to the conservation movement and all who wish to possess the essential facts regarding it. This he has done by condensing into small compass the more important portions of a vast amount of printed information, much of which was widely scattered and much of which was given in the three large volumes constituting the report of the National Conservation Commission, with their total of 1,840 pages. In addition to the printed matter drawn upon, the author has had access to the manuscript sources made available by a number of eminent men, some closely identified with the conservation movement. The work is all the more valuable because, although it necessarily abounds with statistics, yet it has been given life by the author's vigorous method of presentation and by his frequent critical comments. Although the material presented was originally cast in the form of 20 lectures delivered at the University of Wisconsin, it shows very little trace of the lecture room. Of course, the lectures were revised for publication, and, it may be added, they have been supplemented at various points, so that by means of foot-notes and otherwise some of the information is brought down well into the middle of 1910.

To give our readers a general idea of the viewpoint of the author, we quote his opening remarks, in which he defines natural resources and conservation:

> By natural resources are meant those resources provided by nature which may be used for the benefit of man. The natural resources from the point of view of conservation may be divided into two classes: those so abundant as to be practically unlimited in quantity, and those less abundant which are so limited in amount as to be unequal to the present or future needs of man. The first class requires no special consideration. These lectures will therefore be confined to the second class, and to the natural resources of the United States.
>
> The natural resources limited in quantity should be conserved. By their conservation is meant that they should remain as nearly undiminished as possible in order that this heritage of natural wealth may pass in full measure to succeeding generations.
>
> The full accomplishment of conservation of our limited natural resources is not possible. With reference to waters it may be. Ever the sun draws the water from the ocean; the currents of air carry it over the land; it falls upon the earth; and so the streams flow down to the sea perpetually. It may be that our forests can be so handled that in the future the annual growth shall equal the annual consumption. In that case forests may be perpetuated. The situation is not so clear with reference to soils and minerals. As yet it seems extremely difficult, if not impossible, so to handle the soils by agricultural processes as not to depiete them in their richness, in such a manner as not to result in loss by erosion. With reference to the metals, their use necessarily dissipates some part of them; and therefore the total supply of the world's available metals is being diminished in quantity.
>
> The mineral fuels, when taken from the ground and used, are gone. Thus it is impracticable, indeed impossible, to transmit to our descendants all the fuel which nature has granted us, except upon the basis of nonuse, and this no one would advocate.
>
> Therefore the problem of the conservation of our natural resources has different aspects with reference to the different groups of these resources.

The volume is divided into five main parts, dealing successively with Mineral Resources, Water, Forests, Land, and Conservation and Mankind. In addition, there are appendices containing the declaration of principles adopted by the First Conference of Governors, by the North American Conservation Conference, and by the National Conservation Association.

Each of the first four main divisions includes a descriptive and statistical review, in the course of which particular attention is paid to the wastes which occur in the processes incident to wresting natural resources from the earth or to conversion to the use of man. Estimates of the quantities of coal, oil, gas, iron, etc., are given and also of the possible date of their exhaustion. Under "Water" the fly-off, the cut-off and the run-off, water powers, navigation and irrigation are considered in their many and various details. "Forests" and "The Land" are considered with like fullness. In Part V., on "Conservation and Mankind," the main topics are the principles and the purpose of conservation, the conservation of man himself, population and conservation, and conservation and patriotism.

Throughout the volume continual reference is made to State and National Legislation in its relation to Conservation. The author puts himself strongly on record as in favor of whatever legislation may be necessary to conserve the natural resources of the country for the beneficent use of present and future generations. He does not hesitate to recommend the prohibition by the United States of the exportation of certain natural products likely to be needed in their entirety by the citizens of the United States in the course of a few decades or generations. He also suggests the possible necessity of public regulation of the price of such natural products as coal. He advocates state legislation to compel the recovery of certain possible by-products now often allowed to go to waste by careless miners or manufacturers. As to whether or not restrictions of this sort will be upheld by the courts, Professor Van Hise says:

> The decisions of the highest court make it clear that the needs of our descendants may be protected. The United States Supreme Court declares: "It is recognized that the state as a quasi-sovereign and representative of the interests of the public has a standing in court to protect the atmosphere, the water, and the forests within its territory, irrespective of the assent or dissent of the private owners of the land most immediately concerned." Again, in the same decision: "We are of the opinion further that the constitutional power of the state to insist that its natural advantages shall remain unimpaired by its citizens is not dependent upon any nice estimate of the extent of present use or speculation as to further needs." Further: "Rights of property," says Mr. Justice Shaw in the case of Commonwealth vs. Tewksbury, "like all other social and conventional rights, are subject to such reasonable limitation in their enjoyment as shall prevent them from being injurious, and to such reasonable restraints and regulations established by law, as the legislature, under the governing and controlling power vested in it by the constitution, may think necessary and expedient."*

The author accepts with little reservation the assertion that forests have a very beneficial effect upon the regimen of streams, although he neither cites nor sanctions some of the boldest of the claims put forth by the foresters in support of this theory. In his final summing up, Professor Van Hise refers to the fact that there have been some strong protests made by engineers and others against the claims of the foresters, but in a foot-note, apparently inserted at the last minute before publication, he unqualifiedly states that the claims of Chittenden and Moore, that forests have little effect upon rainfall, have been refuted by Professor Swain and others in the "National Geographical Magazine" for April, 1910.

In dealing with one other subject the author also seems to go unduly far in accepting the theories of the radicals. We refer to his remarks on the reduction of phosphate losses through generally-prevalent methods of sewage disposal. After stating "that the loss of phosphorus in city sewage is the equivalent of at least 1,200,000 tons of high-grade phosphate rock; or, in other words, nearly one-half of the output of the mines in 1908," Professor Van Hise goes on as follows:

> In this country there has been as yet practically no attempt to return the human excrement to the soil. This is true of both country and city. In the country the use of human excrement for a fertilizer is comparatively easy; but to get the farmer to do this is difficult. In reference to the city it has been held that in this country it is impracticable to use sewage for fertilizer. The answer is, it is being done in other countries. The phosphorus of sewage can be saved either by direct use of the sewage or the separation of the phosphorus by some method to be developed. It is certain that one of these must be done, if in the future we are to conserve the fertility of the soil.

So far as this statement relates to the utilization of phosphorus in city sewage, it seems to us to be very misleading. Perhaps if the author had had more space at his disposal he would have qualified his assertions. However that may be, the facts are that only a small percentage of the total sewage of the cities of the world is handled in any manner whatever designed to recover the fertilizing value, either of phosphate or nitrogen. Moreover, if the facts were known, it is probable that whatever conservation of natural resources is being effected anywhere by sewage utilization is more than offset by wastes of some other kind. In other words, while there is no question whatever about the immense theoretical fertilizing value of city sewage, its recovery is in somewhat the same category as the extraction of gold from seawater.

*"Conservation of Our Natural Resources and of Our National Strength and Virility," A. A. Bruce, "Pennsylvania Law Review," Vol. 58, pp. 155, 156, 159.

Notwithstanding all this, it is highly desirable to have attention called again and again to the loss of phosphates and nitrogen incident to the fact that an increasing percentage of the food products of the soil goes to the cities and is never returned directly to the land, as it might be, and to some extent is, returned by the farmer himself in connection with his own food consumption in many of his farming operations. It will be noted that Professor Van Hise recognizes the fact that while, to repeat a portion of the quotation just given, "the use of human excrement for a fertilizer is comparatively easy in the country, yet to get the farmer to do this is difficult." If this difficulty exists in marked degree, as it unquestionably does, as regards the most highly concentrated form of organic wastes available to the farmer, how much greater are the difficulties surrounding the recovery of a small percentage of fertilizing material in city sewage?

The criticisms in which we have just indulged are really very minor when taken in connection with the book as a whole. The volume is one which deserves wide circulation and careful reading. If the reading is accompanied by careful reflection and the reflection leads to action along the many lines which it suggests, the book will do a world of good.

For Millwrights.

PRACTICAL HAND BOOK FOR MILLWRIGHTS.—By Calvin F. Swingle, M. E., Author of "Encyclopedia of Engineering," "Modern Locomotive Engineering," etc. Chicago, Ill.: Frederick J. Drake & Co. Cloth; 5½ x 8 ins.; pp. 411; 226 text illustrations. $2, net.

The construction of mill buildings, the erection of line shafting, the erection of steam engines and boilers, and the setting up of machines follow each other in natural order through the first part of this book. The last hundred pages or so are devoted to the water turbine, hydraulic ram and electric motors.

Building construction is taken up in detail from the excavation for foundations to the construction of roof trusses. Methods of doing the work of construction receive the most attention, but some space is given to such related matters as the testing of cement and the strength of steel beams and girders.

At this point is introduced a discussion of the strength of shafting with tables of horsepower safely transmitted and dimensions for keys and thrust collars. The making and reading of shaft drawings is then explained after which are given instructions for the erection of line shafting. These instructions cover the alinement of the shafting, methods of attaching shafting and machinery in reinforced-concrete buildings, babbiting journal bearings and determination of the proper length of journals. A discussion of transmission by belts, ropes and gear wheels and of systems of lubrication concludes this section of the book.

The next section, dealing with the erection of engines and boilers and the setting up of machines, includes directions for constructing engine and boiler foundations and a discussion of knots and hitches used by riggers. Descriptions are given also of common forms of belt shifters and of some devices for removing pulleys from shafts.

The erection of water turbines is not touched upon, although their operation is explained. A description is given of the turbines at one of the power plants at Niagara Falls. The operation and construction of hydraulic rams is discussed at some length and brief instructions are given for installing them. A discussion of various methods of connecting electric motors to the machines or shafts they are to drive, some notes on pipes and pipe fitting and a few pages of "useful information" conclude the book.

To one already familiar with the terminology of the subjects discussed, the explanations and descriptions in this book will in general be found sufficiently clear, although at a few points it is somewhat difficult to get at the author's meaning. The statement that the tensile strength of concrete has been found in tests to be from 2,000 to 4,000 lbs. per sq. in. (p. 42) is probably a printer's error.

Translation of a German Monograph on Sewage Screening and Sedimentation.

CLARIFICATION OF SEWAGE.—By Dr. Ing. Rudolf Schmeitzner, Chemnitz, Germany. Authorized Translation by A. Elliott Kimberly, C. E., Columbus, Ohio. New York: The Engineering News Publishing Co. Cloth; 6 × 9 ins.; pp. xiv + 113; 2 folding plates and 42 text illustrations. $1.50, net.

The Germans have lately approached the sewage disposal problem in a rational manner. They accept disposal by dilution as often thoroughly satisfactory. Where this is inadequate they supplement dilution by screening or screening and sedimentation, and in special cases by more complete methods of purification. As a consequence, screening and sedimentation, and particularly the former, have been studied and practically developed to a marked degree in Germany.

In 1907, a German engineer visited fifteen German sewage-treatment plants, and subsequently combined the results of his personal observations of screening, sedimentation and sludge disposal with information gathered by correspondence and gleaned from printed sources. The result was a monograph on sewage clarification. The term clarification, however, is here restricted solely to screening and unaided sedimentation. That is, chemical precipitation, septic tanks, gravel, coke or similar strainers, and all finishing processes are left out of account. A valuable service has been rendered by Mr. Kimberly in making Dr. Ing. Schmeitzner's useful monograph available.

From the author's preface we learn that the fifteen plants visited by him included Dresden, Frankfort, Hamburg, Cologne and Mannheim. An examination of the book shows that instead of giving categorical descriptions of the plants visited he has used his notes to elucidate and illustrate his exposition of the principles and practice of sewage clarification. This course has obvious advantages.

After a brief introduction, in which the Prussian health-board regulations for sewage treatment where dilution is insufficient, as well as the conditions affecting disposal by dilution, are given, the author takes up the general principles which should govern the design of clarification plants, and follows this by a few pages on the composition of sewage. He then plunges into his main subject, in a long chapter headed "Component Parts of a Clarification Plant". Of the seventy pages in this chapter twenty are devoted to a description and discussion of various types and actual installations of screens; and fifty to the process of sedimentation, to grit chambers, settling tanks and towers (vertical tanks), and to sludge removal methods. The theory and elements of design are here treated.

A special chapter is devoted to "Sludge Removal and Treatment for the Recovery of By-Products." This appears to be the least valuable portion of the book, for while interesting information is given, both the internal evidence of the chapter itself and the almost universal experience of sewage disposal works is against net revenue from sludge or any great help in reducing operating and fixed charges.

In the brief final chapter the author presents a few generalizations on the "Practical Arrangement of Clarification and Purification Plants." The relative merits of various methods and combinations of methods of sewage treatment are here discussed.

Obviously, in a monograph of this kind an author may properly go into more detail than would be expedient in the limited space devoted to one or two divisions of the complex subject of sewage disposal. The volume is particularly useful on this account and also because it brings to British and American readers much information on German theory and practice heretofore unavailable or not to be had with ease. It should be understood that the treatment throughout is essential engineering in character, and that chemistry and biology scarcely enter into the discussion. The book is in some respects supplementary to portions of Dunbar's "Principles of Sewage Treatment" (the original German of which was written about the same time) in much the same way as Raikes' "Design, Construction and Maintenance of Sewage Disposal Works" is an engineering supplement to Rideal and other British books written by chemists or biologists.

THE TELEGRAPHIC TRANSMISSION OF PHOTOGRAPHS.—By T. Thorne Baker, F. C. S., F. R. P. S., A. I. E. E. New York: D. Van Nostrand Co. Cloth; 5 × 7½ ins.; pp. 146; 2 plates and 64 illustrations. $1.25, net.

Mr. T. T. Baker, himself an inventor of phototelegraphic apparatus, describes the work that has been done in this field in this small, handy volume. The first few pages are historical, briefly referring to early devices by which the transmission of pictures over wire was attempted. The first of these was Bakewell's make-and-break system, in which the transmitter was a cylinder covered with a sheet of tinfoil having the sketch drawn in shellac, the receiver being a similar drum carrying a sheet of chemically prepared paper, which was decomposed in spots by the passage of the current. This was the prototype of the telautograph which has been developed from such a machine, with which it was only just possible to transmit pure black and white monotone sketches, to one which does creditable work with half-tones. A second type of machine described is that having selenium "eyes" which were used to vary the current transmitted according to the light falling upon them and coming through a transparent photograph.

The present-day machines, whose operations are taken up in some detail, are Prof. Korn's selenium and telautograph types and Mr. E. Belin's telesterograph, with which the light and shade contour of a prepared picture moves the arm of a rheostat to vary the line current and deflect a beam of light at the receiver, making a photographic reproduction of the original. Then there are Mr. Baker's mechanisms built on the telautograph principle.

It is interesting to learn that the Korn and Baker machines are a part of the news-gathering equipment of the London "Daily Mirror," and that Mr. Baker has developed these processes for the paper to such a point that they receive news pictures as well as news despatches for prompt publication.

To explain the theory on which these machines operate, it is necessary to employ language and symbolic expressions intelligible only to those having a considerable knowledge of physics and electricity. The greater part of the book, however, is written with the evident intention of very simply presenting enough purely descriptive matter that any non-technical reader could at least gain an inkling of what can be done.

DIMENSIONS OF PIPE, FITTINGS AND VALVES.—Compiled and Arranged for Engineers, Architects and Draftsmen; Also Containing Some Information on Steam Heating, Bath Room Fixtures, Etc. Third Edition. Collinwood, Ohio: The National Book Co. Cloth; 6 × 9 ins.; pp. 87; tables and numerous text illustrations. 75 cts.

Text, diagrams and tables of pipes, fittings and valves have been compiled from various sources into a labor-saving booklet for draftsmen. The one great lack, found in this edition as in previous ones, lies in the failure to include details of cast-iron pipe joints, such as the "hub-and-spigot"; these could have been obtained from the specifications of the American or the New England Water Works Association.

PRACTICAL SHAFT SINKING.—By Francis Donaldson, M. E., Chief Engineer, The Dravo Contracting Co. New York: McGraw-Hill Book Co. Cloth; 6¼ × 9½ ins.; pp. 143; 63 text illustrations. $2, net.

With the exception of some few additions and changes necessary to its publication in book form the subject matter of this book appeared as a series of articles in "Mines and Minerals" during 1909 and 1910. Its collection into a more permanent form is greatly to be commended for it is a very concise, up-to-date and complete treatment of the methods and costs of the sinking of shafts. The chapters on costs are particularly valuable, since there are few available sources of this material.

Waterway Terminals.

TRANSPORTATION BY WATER IN THE UNITED STATES.—Report of the Commissioner of Corporations. Part III.:—Water Terminals. Sept. 2[illegible] 1910. Washington, D. C.: Pub. Doc. (Herbert Knox Smith, Commissioner). Paper; 5¾ × 9 ins.; pp. 436.

Some three years ago President Roosevelt directed the Bureau of Corporations of the Department of Commerce and Labor to investigate and to report upon transportation by water in the United States, so that some statistical basis might be had by which to govern future policies of inland and coast navigation in this country. So far as the engineering features of the country's waterways are concerned the War Department, through the Corps of Engineers, has the the necessary data and exercises the necessary control, but the commercial and economic side of waterway transportation had been somewhat neglected, and, in view of the great revival of interest in this industry, it became imperative that all available information should be collected and collated. This was the task of the Bureau of Corporations, through its Commisisoner, Mr. Herbert Knox Smith.

The first two volumes of the report, dated July, 1909 (reviewed in Engineering News, Sept. 16, 1909, p. 22) took up respectively the "General Conditions of Transportation" and "Water-borne Traffic." They were mainly compilations of statistical data regarding the steamboat and barge business on our rivers and coasts, matter well enough known by those engaged in this traffic but never heretofore collected in one volume. This third part which has but recently appeared is labeled "Water Terminals," and it takes up in consecutive order and in much detail the history and description of all of the important waterways ports in the United States. The matter appearing in it, while perhaps not more difficult to obtain than that in the first two volumes, is certainly much more interesting to those who are studying the inland waterways movement.

The report is preceded by a letter of transmittal from Commissioner Smith, which is really a little essay on terminals. Then follows the separate description of each port, including in that description the physical data, the ownership, administration and finances. The next chapter is on the general subject of port control, municipal or corporate; the next on storage facilities and handling equipment and the final one on port and terminal charges.

It is too late a day to emphasize here the importance of the terminal in any transportation system; that has now become an obvious fact. The railways are rapidly recognizing it in their terminal construction and the waterways enthusiasts are being driven to admit it in practice as well as in theory. One reading of this last report with its repeated record of inefficient and insufficient port facilities and inconsistent port charges prevailing over the country will convince any one that there is more real need for concerted movement here than on all the waterways on the continent. It is a most valuable record.

UNITED STATES GEOLOGICAL SURVEY.—Bulletin 437. Results of Spirit Leveling in Maine, New Hampshire and Vermont. R. B. Marshall, Chief Geographer. Washington, D. C.: Pub. Doc. Paper; 5¾ × 9 ins.; pp. 59.

Bulletin 434. Results of Spirit Leveling in Delaware, District of Columbia, Maryland and Virginia. Paper; 5¾ × 9 ins.; pp. 74.

These two bulletins describe the extent of level work done by the Geological Survey during the last 13 years. Elevations and descriptions of bench marks in the states covered are given. These lists include all previous work of the Geological Survey. The elevations given are based on a common mean sea level datum. The main control is the adjustment made in 1903 by the Coast and Geodetic Survey of a great net of precise levels which combines the work of various organizations.

A copy of one of the bulletins will be found useful to almost any engineer who has surveying work to do in these states. The bench marks are fully described and the elevations given to thousandths of a foot. The lists are divided into groups for each locality so that the locations of all the bench marks in one vicinity can be found without difficulty.

The Explosibility of Coal Dust.

BULLETINS U. S. GEOLOGICAL SURVEY.—Geo. Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ x 9 ins.
No. 423: The Explosibility of Coal Dust. By George S. Rice. with chapters by J. C. Frazer, Axel Larsen, Frank Haas, and Carl Scholz. Pp. 186; 23 plates and 28 text illustrations.

This bulletin was prepared by the Technologic Branch of the U. S. Geological Survey, now a part of the Bureau of Mines, so that it will be distributed by the Bureau of Mines. The author, Mr. G. S. Rice, Chief Mining Engineer of the Bureau, goes fully into one of the very serious and perplexing problems with which the coal mines have had to contend in the last few years. He traces the growth in the belief in the explosibility of coal dust, summarizes the experiments and mine investigations that have established this belief and gives the present status of preventive measures. The explosibility of coal dust in foreign countries is discussed, particularly as to France, where it was not believed that coal dust alone would explode until 1906.

Experiments have been made in an experimental gallery at Pittsburg which are described, with a discussion of results, in this bulletin. Mr. Rice makes the following conclusions from his studies:

(1) That coal dust will explode under some circumstances, both in the presence of firedamp and without it, is now generally accepted by mining men.

(2) Experiments at Pittsburg indicate that under ordinary conditions the dust must be from coal having at least about 10% of volatile combustible matter, though in certain foreign experiments, it is claimed explosions were obtained with charcoal dust.

(3) Dusts with higher percentages of volatile combustible matter are more sensitive, ash, moisture contents, and size being constant. This view is based partly on the preliminary experiments at Pittsburg and on the results of experiments of M. Taffanel and other foreign investigators. Where there is a large amount of dry coal dust, judging from the Pittsburg experiments, a humid atmosphere has little effect on ignition of dust or propagation of an explosion. A long continuance of the humid conditions renders the coal dust moist and inert, but the presence of moisture in the air at the moment of explosion is not sufficient to prevent an explosion; hat is, not enough moisture is carried by the mine air to reduce materially the temperature of the flame. Fully saturated vapor at 65° F., an ordinary mine temperature in this country, weighs 6.78 grains per cu. ft. Coal dust suspended in such a saturated atmosphere in a cloud of moderate density weighs, say, 200 grams per cu. meter. The weight of vapor is 7.8% of the weight of dust. The Pittsburg experiments with wetted dust showed that several times this percentage of moisture in the dust, in addition to a nearly saturated atmosphere, was required to prevent propagation.

(4) The great purpose of artificially humidifying mine air is that it may serve as a vehicle for carrying water to the dust.

This bulletin may be obtained by addressing the Director of the Bureau of Mines, Washington, D. C.

THE IMPROVEMENT OF FORT WAYNE.—Report of Charles Mulford Robinson to the Fort Wayne (Ind.) Civic Improvement Association. Rochester, N. Y.: The Author. Stiff paper; 6 x 9¼ ins.; pp. 123; folding map and numerous illustrations.

If the smaller cities of our country are as quick to improve their looks as they are anxious to learn how to do so, we are very hopeful of our future civic beauty. The little book before us is but one of a number of like reports made by experts to commissions or associations, and, like the others, it pictures a very worthy ideal at which we hope the respective cities will at least aim.

RECONSTRUCTION OF STREET RAILWAYS IN CHICAGO.—Second Annual Report of the Board of Supervising Engineers. Chicago. Cloth; 6 x 9 ins.; pp. 522; illustrated.

The report of the Board, with its financial and statistical statements, covers 168 pages and reviews the work done during the year. The report of the Chief Engineer (120 pages) deals with the work in general, and also with the various studies and investigations made in regard to treated ties, track deflection, current consumption, etc. Carhouse construction and car design and ventilation are discussed, among other matters. The remainder of the volume is devoted to a digest of the proceedings of each meeting of the Board.

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109 pages, 6 x 9, illustrated, $1.50 (6/6) net, postpaid.

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MISCELLANEOUS BOOKS OF 1910

Factory Organization and Administration
By Hugo Diemer, Prof. of Industrial Engineering, Penn. State College.
317 pages, 6 x 9. Illustrated. $3.00 (12/6) net, postpaid.

Heat Engines; Steam, Gas and Steam Turbines, Auxiliaries
By John R. Allen, Professor, and Joseph A. Bursley, Asst. Prof. of Mechanical Engineering, University of Michigan.
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Principles of Metallurgy
By Charles H. Fulton, President and Professor of Metallurgy, South Dakota School of Mines.
536 pages, 6 x 9. Illustrated. $5.00 (21s.) net, postpaid.

Corrosion and Preservation of Iron and Steel
By A. S. Cushman, A. M., Ph. D., and Henry A. Gardner.
375 pages, 6 x 9. Illustrated. $4.00 (17s.) net, postpaid.

Principles of Wireless Telegraphy
By Geo. W. Pierce, Associate Professor of Physics, Harvard University.
350 pages, 6 x 9. Illustrated. $3.00 (12/6) net, postpaid.

Composition and Heat Treatment of Steel
By E. F. Lake, Steel Editor of the American Machinist.
252 pages. Illustrated. $2.50 (10/6) net, postpaid.

Proceedings—Fifth Congress of the International Association for Testing Materials. Copenhagen, 1910.
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THE CONSTRUCTION OF GRAPHICAL CHARTS.—By John B. Peddle, Professor of Machine Design, Rose Polytechnic Institute. New York and London, England: McGraw-Hill Book Co. Cloth; 6½ x 9½ ins.; pp. 100; 58 text illustrations. $1.50, net.

As a first work on Diagrams in the English language, this modest volume merits appreciative reading. In all fields of technical work, graphical charts, curve sheets, diagrams, etc., are used to an extent that is surprising, and their use is increasing steadily. The variety of kinds of diagrams is such as to make a thorough compilation and discussion of peculiarities desirable. This refers especially to curve-diagrams, rather than to calculating scales. However, the latter have other claims for an important place in a work on Graphical Charts, and Prof. Peddle has recognized these claims to the extent of giving more space to calculating scales or rectilinear diagrams than to ordinary coordinate diagrams.

In summary, the book gives 15 pages to coordinate diagrams, 28 pages to ordinary rectilinear diagrams, 5 pages to hexagonal index diagrams, 20 pages to proportional charts (a class of rectilinear diagram), 12 pages to three-dimensional charts (solid models), and 30 pages to Empirical Equations, discussing methods for determining formula constants from plotted results.

The matter dealing with rectilinear diagrams is clear and well detailed; it should enable anyone to adapt this type of chart to his own computation uses. A recent French adaptation of rectilinear charts to the evolution of formula constants is presented in the chapter on Empirical Equations. On the other hand the chapter on rectangular-coordinate diagrams is far too short to do the subject justice, and in this part the book will most easily bear enlargement in a future edition.

WATER-SUPPLY PAPERS, U. S. GEOLOGICAL SURVEY.—George Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ x 9 ins.

No. 235: Underground Waters for Farm Use. By Myron L. Fuller. Pp. 58; 17 plates and 27 text figures.

The general public is often of the impression that spring and well water of the country is much purer and more healthful than city water supplies. In reality polluted water is exceedingly common on farms and typhoid fever death rates are usually greater in country than in congested districts; and were it not for the other healthful conditions of country life, it would doubtless be still greater.

Many failures to protect farm water supplies for drinking purposes arise from ignorance of the manner in which waters circulate through the ground, and of the ways in which they may become polluted. This report is therefore designed for the general reader and is written in a very clear and interesting way.

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It is a book which should be in the hands of every farmer and person with a country home and will be of interest to all students of water supply and sanitation.

MODERN MANUFACTURE OF PORTLAND CEMENT.—A Handbook for Manufacturers, Users and all interested in Portland Cement. By Percy C. H. West, Fellow of the Chemical Society and of the Society of Chemical Industry. Vol. I.—Machinery and Kilns. New York: McGraw-Hill Book Co. London, England: Crosby Lockwood & Son. Cloth; 6½ x 9¾ ins.; pp. 255; 154 text illustrations and numerous tables. $4, net.

The production of Portland cement has increased so rapidly in the last ten years that those qualified to describe its method of manufacture have not had the time to devote to anything but the actual design and operation of the plants. Consequently the literature of cement manufacture is very meagre, and any addition to it should be welcomed. Evidently, Mr. West has in mind an extensive work on the subject, for the book before us is labeled Vol. I, a promise of additional volumes. He seems to have the cart before the horse, for this published volume is on "Machinery and Kilns" while a prefatory paragraph states that "in a separate volume the writer hopes to deal with the chemical and physical testing of the raw materials and finished product and the general control of the manufacturing product."

This initial volume is quite valuable to the cement manufacturer. It assumes a full preliminary knowledge of the methods of making Portland cement and devotes itself entirely to descriptions of the many and various machines and devices used in that manufacture. While most of these descriptions are of European machines and small attention is paid to the somewhat different American practice, this very fact should make the work interesting to those on this side of the ocean. We think, however, that the author would have done well to have prefaced the work with a not too lengthy description of the general methods of cement manufacture. His book would then have had value as a text as well as a reference.

BULLETINS U. S. GEOLOGICAL SURVEY.—Geo. Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 6 x 9 ins.

No. 444: Bibliography of North American Geology for 1909, with Subject Index. By John M. Nickles. Pp. 174.

This bulletin of the Geological Survey is a supplement to Nos. 372 and 409 for the years 1906-'07 and 1908 respectively. It contains 1,305 entries of articles on the geology of North America, adjoining islands, Panama and the Hawaiian Islands. Articles by foreign authors are not included unless published in American periodicals. The main index is arranged alphabetically by authors. A subject index of short titles covers 42 pages at the end of the bulletin.

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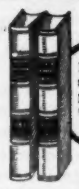

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MACHINE DRAWING.—The Principles of Graphic Expression as Illustrated by Machine Drawing, Together with the Technique of Drafting, Dimensioning and Sketching. By Gardner C. Anthony, A. M., Sc. D., Professor of Drawing and Dean of the Engineering School, Tufts College. Boston, Mass.: D. C. Heath & Co. Cloth; 7½ × 6 ins.; pp. 104; 127 text illustrations and 5 tables. $1.50.

In this new edition of a book originally copyrighted in 1893 it is assumed that the reader has already a knowledge of the use of instruments, projection and other essentials of elementary graphics.

The first two chapters deal with screw threads, bolts and screws. The various screw threads and forms of bolt heads are described and also the methods of representing them on drawings. Among conventional representations of screw threads is shown a method by light and heavy inclined lines in which the heavy lines are drawn only half way across the width of the screw's projection. The author does not appear clear, however, as to the proper usefulness of this method. He entirely overlooks its incidental value as a form of shading to bring out the cylindrical shape of the screw. In fact in many of the examples given throughout the book, the wrong side of the screw projection is shaded in this way, so that an element of confusion is introduced.

Chapters III. to VI. are concerned with general rules for making drawings, sectional views, dimensioning and freehand sketching of machine parts. Brief instructions in lettering are included in the chapter of general rules. The chapter on sectional views deals not only with the method of representing sections but also gives a number of concise rules covering some of the cases where it is desirable, in the author's opinion, to deviate somewhat from a strict geometrical section. The chapter on dimensioning ends with a list of a half-dozen points to be borne in mind while checking a drawing. In the chapter on technical sketching, suggestions are included as to the conditions under which it is advisable to resort to freehand sketching in place of instrument work. The final chapter presents a number of well-chosen examples for practice, which will be found of some value also for reference. The 13 specimen drawings, which are accompanied by concise explanatory notes, include drawings of a steam-engine crosshead, connecting rod and cylinder and of the head and tail stocks of an engine lathe.

The size and shape of this book make it convenient for use directly on the drawing board, and the arrangement of text and illustrations contributes to both the convenience and neat appearance of the pages.

THE CHEMISTS' POCKET MANUAL.—A Practical Handbook Containing Tables, Formulas, Calculations, Information, Physical and Analytical Methods for the Use of Chemists, Chemical Engineers, Assayers, Metallurgists, Manufacturers and Students. By Richard K. Meade, M. S., author of "Portland Cement," etc. Second edition. Easton, Pa.: The Chemical Publishing Co. Stiff Morocco; 4 × 6¼ ins.; pp. 443; 39 text illustrations. $3.

While this handbook should prove a great convenience to chemists and chemical engineers generally, it would seem of particular help to those engaged in actual analysis, for an attempt seems to have been made to gather the data of most service to an analyst—chemical conversion tables showing the content of elements and of certain compounds in various weights of common compounds, standardizing weights, calibrating glassware, standardizing solutions, determinative mineralogy, outlines for common qualitative analysis and for the quantitative anaylsis of flue gases, water, iron and steel, limestone, cement rock, lime, oils, etc., etc.

There is also much of more general service found in the sections devoted to weights and measures, mathematics, stoichiometry, properties of common materials, of chemical compounds, of gases and in the discussions of thermal phenomena, electricity, mechanics, geology, etc. The paper and printing, however, are only fair and the arrangement does not seem entirely logical.

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L'AVIATION DE DEMAIN.—Exposé d'un Nouveau Principe de Construction Basé sur la Récupération. By Francois Ernoult, Ingenieur. Paris, France: Librairie Aéronautique (32 Rue Madame). Paper; 6 × 9¼ ins.; pp. 88; 37 text illustrations. 3 francs; American price, 90 cts.

The author of this self-admitted prophetic book has a theory that the tail end of all vehicles designed to move fast, in whatsoever medium, should be drawn down, through sloping planes, to a point, so that the wave action set up to the rear will be helpful, not harmful, to the motion. The application of this theory to the design of aeroplanes is the subject of the book.

Publications Received.

AMERICAN CERAMIC SOCIETY.—Transactions. Containing Papers and Discussions Read at the Meeting Held at Pittsburg, Pa., Feb. 7-9, 1910, with Some Other Contributions. Vol. XII. Columbus, Ohio: The Society, (Edward Orton, Jr., Secy.) Paper; 6 × 9 ins.; pp. 880; numerous diagrams and text illustrations.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.—Proceedings of the 11th Annual Convention held at Congress Hotel, Chicago, Ill., March 15-17, 1910. In two volumes. Vol. II., Part I.—Business Session; Vol. II., Part II.—Committee Reports and Discussions. Chicago, Ill.: The Association, (962 Monadnock Block, E. H. Fritch, Secy.) Paper; 6 × 9 ins.; pp. 1379; numerous illustrations and tables in text.

BULLETINS U. S. GEOLOGICAL SURVEY.—Geo. Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.

No. 429: Oil and Gas in Louisiana, with a Brief Summary of Their Occurrence in Adjacent States. By G. D. Harris. Pp. 192; 22 plates; 1 folding map (in pocket); 21 text illustrations.

No. 435: A Reconnaissance of Parts of Northwestern New Mexico and Northern Arizona. By N. H. Darton. Pp. 88; 17 plates (2 folding maps, one in pocket); 8 text illustrations.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Transactions. Vol. XXIV., Part I., January to June, 1910. Montreal, Canada: The Society. Paper; 6 × 9¼ ins.; pp. 287; 7 folding plates and numerous text illustrations.

COMPOSITION AND HEAT TREATMENT OF STEEL.—By E. F. Lake, Steel Editor of the "American Machinist." New York and London, England: McGraw-Hill Book Co. Cloth; 6¼ × 9¼ ins.; pp. 252; 143 text illustrations. $2.50, net.

COMPRESSED AIR PLANT.—The Production, Transmission and Use of Compressed Air, with Special Reference to Mine Service. By Robert Peele, Mining Engineer and Professor of Mining in the School of Mines, Columbia University. Second edition, revised and enlarged. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 6 × 9¼ ins.; pp. 502; 209 text illustrations. $3.50, net; English price, 15s., net.

DEPARTMENT OF MINES (Mines Branch), CANADA.—Hon. W. Templeman, Minister. Report of Analyses of Ores, Non-Metallic Minerals, Fuels, etc., Made in the Chemical Laboratories During the Years 1906, 1907, 1908. Arranged by F. C. Walt, M. A., F. C. S., Chief Chemist. Ottawa, Canada: Pub. Doc. Paper; 6½ × 10 ins.; pp. 126.

DYNAMO ELECTRIC MACHINERY: ITS CONSTRUCTION DESIGN AND OPERATION.—Direct-Current Machines. By Samuel Sheldon, A. M., PH. D., D. Sc., and Erich Hausmann, E. E., M. S. Eighth edition, completely rewritten. New York: D. Van Nostrand Company. Cloth; 5¼ × 7¾ ins.; pp. 328; 210 text illustrations. $2.50, net.

EDISON: HIS LIFE AND INVENTIONS.—By Frank Lewis Dyer, General Counsel for the Edison Laboratory and Allied Interests, and Thomas Commerford Martin, ex-President of the American Institute of Electrical Engineers. In two volumes. New York and London, England: Harper & Brothers, Publishers. Cloth; 5½ × 8½ ins.; (I.) pp. 472; 17 illustrations; (II.) pp. 517; 9 illustrations. $4 per set.

ELECTRICITY EXPERIMENTALLY AND PRACTICALLY APPLIED.—Principles, Experiments, Practical Applications and Problems. A Book for the Beginner and for the Practical Man. By Sidney Whitmore Ashe, B. S., F. E.; Author of "Electric Railways." New York: D. Van Nostrand Co. Cloth; 5¼ × 7¾ ins.; pp. 349; 422 text illustrations. $2, net.

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS.—By James D. Hoffman, M. E., Professor of Engineering Design, Purdue University; assisted by Benjamin F. Raber, B. S., M. E., Instructor in Engineering Design, Purdue University. Lafayette, Ind.: The Authors. Flexible morocco; 4½ × 7 ins.; pp. 315; 109 text illustrations; appendix, with tables and diagrams. $3.50, postpaid.

HINTS TO IRRIGATORS IN THE VALLEY OF THE RIO GRANDE.—By H. Scougall, C. E.; Consulting Irrigation Engineer, Santa Rosalia, Chihuahua: S. Pearson & Sons. Paper; 5½ × 8¼ ins.; pp. 16. 50 cts. per single copy; Farmers' Clubs and Irigation Companies taking 50 copies or over, 40 cts. per copy.

AN IMPROVED WATER-SUPPLY FOR THE CITY OF MONTREAL.—Report made to His Worship the Mayor and the Commissioners of the City of Montreal, Montreal, Quebec, by Hering & Fuller, Consulting Engineers, July, 2, 1910. New York: Hering & Fuller. Paper; 6¾ × 9½ ins.; pp. 70.

INSECTS AND DISEASE.—A Popular Account of the Way in Which Insects May Spread or Cause Some of Our Common Diseases. By Rennie W. Doane, A. B., Assistant Professor of Entomology, Leland Stanford Junior University. New York: Henry Holt & Co. Cloth; 5¼ × 8 ins.; pp. 227; 112 illustrations in the text. $1.50, net; by mail, $1.62.

IRELAND, INSTITUTION OF CIVIL ENGINEERS.—Transactions, 73th Session, November, 1908, to May, 1909. Vol. XXXVI. Dublin, Ireland: The Institution, (35 Dawson St.; James T. Jackson, Hon. Secy.) Paper; 5½ × 8½ ins.; pp. 262 + 19; 14 folding plates and numerous text illustrations.

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THE NORTH POLE.—Its Discovery in 1909 Under the Auspices of the Peary Arctic Club. By Robert E. Peary, with an Introduction by Theodore Roosevelt and a Foreword by Gilbert H. Grosvenor, Director and Editor, National Geographic Society. New York: Frederick A. Stokes Co. Cloth; 6¾ × 9¾ ins.; pp. 373; 1 map, 8 plates and 100 text illustrations. $4.80, net.

THE OFFICIAL YEAR BOOK OF NEW SOUTH WALES 1908-9.—By John B. Trivett, F. R. A. S., F. S. S., (Government Statistician). Published by Authority of the Government of the State of New South Wales. Sydney, New South Wales: Pub. Doc. Pasteboard; 6¼ × 10 ins.; pp. 572; one folding map.

DER KAUTSCHUK UND SEINE PRUFUNG.—By Prof. Dr. F. W. Hinrichsen und Dipl. Ing. K. Memmler. Leipzig, Germany: S. Hirzel. Paper; 6 × 9 ins.; pp. 263; 64 text illustrations. 8 marks; American price, $3.20; postage extra.

THE PUBLIC DOMAIN AND DEMOCRACY.—A Study of Social Economic and Political Problems in the United States in Relation to Western Development. Vol. XXXVIII., No. 1. [Whole Number 100.] By Robert Tudor Hill, Ph. D., Sometime University Fellow in Sociology. Edited by the Faculty of Political Science of Columbia University. New York: Columbia University, (Longmans, Green & Co., Agents.) London, England: P. S. King & Son. Paper; 6¼ x 9½ ins.; pp. 253. $2, net; cloth-bound, 50 cts. additional.

RAILROAD FIELD GEOMETRY.—By William G. Raymond, C. E., L. L. D., Professor of Civil Engineering and Dean of the College of Applied Science, State University of Iowa. First edition. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Flexible morocco; 4¼ x 7 ins.; pp. 246; 18 plates and 107 text illustrations. $2, net.

READINGS IN CIVIL GOVERNMENT.—By Percy Lewis Kaye, Ph. D., Head of the Department of History in the Baltimore City College. New York: The Century Co. Cloth; 5¼ x 7¾ ins.; pp. 535. $1.20, net.

ROCK DRILLS.—Design, Construction, and Use. By Eustace M. Weston, Associate School of Mines, Ballarat; Reef Lecturer on Mining, Transvaal University College. New York and London, England: McGraw-Hill Book Co. Cloth; 6¼ x 9¼ ins.; pp. 367; 193 text illustrations and numerous tables. $4, net.

SEWAGE PURIFICATION EXPERIMENTS AND SEWAGE DISPOSAL.—Report to the Common Council of the City of Gloversville, N. Y., by Harrison P. Eddy, Consulting Engineer, and Morrell Vrooman, City Engineer, Aug. 7, 1909. Boston, Mass.: Harrison P. Eddy, (14 Beacon St.) Paper; 6¼ x 9¼ ins.; pp. 330; 1 folding plate (plan); 10 diagrams; 66 tables in text; 19 appendixes (tables).

THE STATE AND THE DOCTOR.—By Sidney and Beatrice Webb. New York and London, England: Longmans, Green & Co. Cloth; 5¼ x 9 ins.; pp. 276 + 24. $2, net.

STATIQUE GRAPHIQUE DES SYSTEMES DE L'ESPACE.—By B. Mayor, Professor a l'Ecole d'Ingénieurs et a la Faculté des Sciences de l'Université de Lausanne. Lausanne, France: F. Rouge & Cie, Librairie, (6 Rue Haldimand).
Texte: Paper; 6¼ x 9¼ ins.; pp. 205; 16 text illustrations.
Atlas: Paper; 6¾ x 9¼ ins.; 7 plates (plans). 8 francs; American price, $2.40.

STEAM-SHIPS.—The Story of Their Development to the Present Day. By R. A. Fletcher. Philadelphia, Pa.: J. B. Lippincott Co. London, England: Sidgwick & Jackson, Ltd. Cloth; 7 x 10 ins.; pp. 421; 150 text illustrations. $3.75, net.

THE TESLA HIGH-FREQUENCY COIL.—Its Construction and Uses. By George F. Haller and Elmer Tiling Cunningham. New York: D. Van Nostrand Co. Cloth; 5½ x 8 ins.; pp. 119; 7 plates and 49 text illustrations. $1.25, net.

TURBINES A VAPEUR.—By Le Commandant F. Cordier, Chef D'Escadron, a la Section Technique de L'Artillerie, Ingenieur-Electricien de L'Institut Electrochimique de Grenoble. Paris, France: Octave Doin & Sons, (8, Place de L'Odeon). Cloth; 4¾ x 7¼ ins.; pp. 460; 118 illustrations in text. 5 francs; American price, $1.50.

U. S. DEPARTMENT OF COMMERCE AND LABOR.—Bureau of Manufactures, John M. Carson, Chief. Washington, D. C.: Pub. Doc. Paper; 6 x 9 ins.
Special Agents Series, No. 34: Machine-Tool Trade in Austria-Hungary, Denmark, Russia and Netherlands, with Supplementary Reports on Italy and France. By Godfrey L. Garden, Captain, U. S. Revenue-Cutter Service, Special Agent of the Department of Commerce and Labor; pp. 179; 29 text illustrations.
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UNIVERSITY OF ARIZONA, AGRICULTURAL EXPERIMENT STATION.—Bulletin No. 64: Groundwater Supply and Irrigation in the Rillito Valley. By G. E. P. Smith. Tucson, Ariz.: The Experiment Station. Stiff paper; 6 x 9 ins.; pp. 244; 63 text illustrations. [Bulletins will be sent gratis.]

WATER RESOURCES OF THE STATE OF NEW YORK.—By Henry H. Persons, President of N. Y. State Water Supply Commission. Albany, N. Y.: Pub. Doc. (David R. Cooper, Secy.) Stiff paper; 7 x 10 ins.; pp. 30; one folding map; five plates (one folding).

WATER-SUPPLY PAPERS, U. S. GEOLOGICAL SURVEY.—Geo. Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ x 9 ins.
No. 233: Water Powers of the Cascade Range. Part I.—Southern Washington. By John C. Stevens. Prepared in cooperation with the State of Washington. Pp. 94; 21 plates and 3 text illustrations.
No. 260: Preliminary Report on the Ground Waters of Estancia Valley, New Mexico. By Oscar E. Meinzer. Pp. 33.

WESTERN RAILWAY CLUB.—Official Proceedings for the year 1909-10. Chicago, Ill.: The Club, (Jos. W. Taylor, Secy.) Cloth; 6 x 9 ins.; pp. 391; two folding plates and numerous text illustrations. $2 per year; 25 cts. per copy.

WIRELESS TELEGRAPH CONSTRUCTION FOR AMATEURS.—By Alfred Powell Morgan, Editor Mechanical and Electrical Department of the "Boys' Magazine." New York: D. Van Nostrand Co. Cloth; 5¼ x 7¾ ins.; pp. 188; 4 plates and 147 illustrations. $1.50, net.

WORKINGMEN'S INSURANCE IN EUROPE.—By Lee K. Frankel and Miles M. Dawson, with the cooperation of Louis I. Dublin. New York: Charities Publication Committee. Cloth; 6 x 9¼ ins.; pp. 477; 145 tables. $2.50, net; by mail, $2.70.

"WORLD CORPORATION."—By King Camp Gillette, Discoverer of the Principles and Inventor of the System of "World Corporation." Boston, Mass.: The New England News Co. Cloth; 6 x 9¼ ins.; pp. 240.

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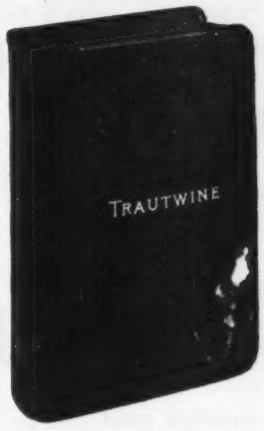

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